

**Wood Burning with Modern Equipment Good for Maine's Environment**  
**A Presentation to the Governor's Wood to Energy Task Force**  
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Burning wood to heat our homes, a strong tradition in Maine, is likely to take on a more prominent role this winter in the face of record high heating oil prices. The good news is that done properly and using updated equipment, wood burning can be good for the environment as well as our wallets.

The “other news” is that there are air quality issues associated with wood burning. This presentation is intended to address the benefits of burning with wood, specific air quality concerns related to wood burning, existing regulations addressing wood burning, new regulations being developed, and regional, national and international efforts regarding wood burning.

**Benefits of Burning with Wood**

Maine citizens have known for a long time some of the benefits to burning with wood – from the comfort of the woodstove to the satisfying feeling of self-reliance. Today we can also look at wood burning in different terms – it is good for climate change mitigation and has a lower carbon footprint than other fuels.

Using a renewable fuel that is generally available locally has several benefits. As a Maine-grown renewable resource, wood displaces fuel oil that is imported from overseas. If we manage our forest resources responsibly, we know that wood fuel will always be available despite the state of the economy or the availability of imported oil.

Generally speaking, burning wood doesn't contribute to the problem of climate change as long as a sustainable wood supply is maintained. When wood fuel is harvested sustainably, the carbon demand of young, growing trees counters the carbon released when old wood is burned. A sustainable fuel supply that is locally available also represents a smaller “carbon footprint” associated with transportation. The climate change impact of having to barge oil from overseas, transfer it to terminals or large trucks, then transfer it again to local delivery vehicles dwarfs that of in-state wood delivery.

**Air Quality Concerns**

When looking at air quality, fine particulates are the pollutant of concern when burning wood. These microscopic particles tend to remain airborne and can get into your eyes and respiratory system where they can aggravate chronic heart and lung illnesses, and cause health problems ranging from burning eyes to bronchitis. Maine meets the national air quality standard for fine particulates, but an increase in wood burning without proper operational practices and clean-burning equipment could add a significant amount of fine particulates to the atmosphere.

In addition, there are several toxic compounds associated with wood burning, and these are present in unburned superfine particles. They include polycyclic organic matter (POM), polycyclic aromatic hydrocarbons (PAH), and some metals. Fortunately, today's cleaner-burning technology provides a more thorough combustion which reduces emissions of these compounds.

One way to look at the quality of wood burning emissions is with a simple equation that addresses three areas that can significantly address the quality of emissions:

$$\textit{Emissions Quality} = \textit{Engineering} \times \textit{Siting and Set-up} \times \textit{Operation}$$

First and foremost, the engineering and design of the wood burning unit is paramount. Many design changes have taken place since your grandfather's wood stove was first installed, or from the days of the first generation of outdoor wood boilers. These engineering improvements have not only greatly reduced the amount of emissions, but their improved efficiency has reduced the amount of wood required to be burned for an equivalent heat output. In other words, with a highly engineered wood burning unit you can pollute less and burn less wood at the same time.

The siting and set-up of a wood burner is especially important not only for the home it is heating, but also for neighbors that are close to the wood burner. When the temperature of the firebox is low, often because the flow of air is reduced, thicker smoke laden with particulate matter hangs in the area near and upwind of the chimney. To minimize the impacts of particulates and toxics from smoke in the breathing zone around outdoor wood boilers, providing the proper combination of a setback from the property line as well as an adequate stack height is key..

Finally, the proper operation of any wood burner is also important to improving the quality of emissions. It is important to burn properly seasoned firewood in a mixture of sizes, burn only clean wood, and not overload the wood burning unit. Outdoor wood boilers, often installed with short stacks, can contribute smoke at low levels if not properly sited and operated.

The great news for burning wood is that technology now emerging from European and Scandinavian countries shows tremendous reductions in air emissions and improvements in thermal efficiency compared to older wood burning technology. The improvements, which result in more heat and less smoke from burning wood, produce emissions close to those from new oil burning appliances.

### **Existing Regulations**

The Maine Department of Environmental Protection (DEP) presently regulates the siting, installation, and operation of outdoor wood boilers, or OWBs. For new residential or commercial OWB installations there are: requirements for setbacks from property lines or dwellings on adjacent property, stack height requirements, emission standards for the units themselves, and operational requirements including smoke opacity specifications and a nuisance prohibition. The initial, or "Phase I," emission standard became effective on April 1, 2008 and a reduced, or "Phase II," emission limit takes effect on April 1, 2010.

The U.S. Environmental Protection Agency (EPA) has established a program where manufacturers can voluntarily have OWB units “certified” if they meet an emission standard, and this coincides with Maine’s “Phase I” standard. However, Maine’s “Phase II” standard that takes effect in 2010 will be stricter than the voluntary EPA standard.

Existing OWBs, while not subject to the emissions standards, setbacks, or stack height requirements, are subject to the operational requirements to follow the smoke opacity standard and not create a nuisance. Often, changing the stack height or setback can address the nuisance requirement that smoke not cross into the “breathing zone” of an abutter’s land.

Larger commercial and industrial wood boilers (greater than ten million BTUs per hour) are also regulated and licensed by DEP. This program, which focuses on the larger air emission sources, also has federal oversight from the EPA. Requirements for these larger boilers include constant stack monitoring, stack testing, air dispersion modeling, stack height specifications, and various inspection and reporting requirements.

Indoor wood stoves are not regulated by the state DEP, but for the last 20 years the federal EPA has required that new wood stoves meet certain emissions standards. These emission requirements have greatly decreased the amount of particulate matter emitted by indoor residential wood stoves.

Indoor wood boilers are presently not regulated by either the DEP or the EPA. There have been some instances of OWBs being installed inside a structure in order to avoid regulation under Maine’s requirements, but this has created a dangerous situation that often ignites the surrounding structure. OWBs are designed to operate outdoors, while indoor wood boilers are those units that are specifically designed to operate indoors.

One other type of wood-burning unit that is not presently regulated is the small wood boiler that is between the size of an OWB and the ten million BTU/hour air licensing threshold. ( Note that there are some units between one and ten million BTU/hour that are regulated, but this is because they are associated with a source that generally requires an air emissions license.)

### **New Regulations**

With the enactment of Public Law 2007, chapter 190 the Maine legislature directed the adoption of rules, including emission standards, to control OWBs that burn biomass pellets by April 2009. These initial rules are routine technical rules that will need approval by the Board of Environmental Protection and the target date for the adoption of these rules is by the end of 2008.

While most complaints about improper OWB siting, installation, or operation have been resolved by working with the particular OWB operator, there are a few “problem” OWB units that, generally because of their siting, are unable to meet DEP standards. Because an OWB unit is often a large investment and the owner may not be readily willing (or able) to purchase a newer cleaner-burning unit, Public Law 2007, chapter 680, created a fund to replace older, problematic

units with newer clean-burning units. To date, there has not been any money dedicated to this OWB replacement program.

### **Regional and National Activities**

While states have been addressing the regulation of OWB emissions, the EPA appears poised to regulate OWBs in the near future with the likely implementation of national standards. It is unclear at this time whether indoor wood boilers will be addressed by the EPA anytime soon.

EPA is also reviewing the potential need for emission standards for small commercial and industrial wood boilers, helping fill the gap where the emissions from these units are presently not regulated at all.

The exciting news is that technology emerging from overseas is producing residential and commercial wood burning units that have very clean emissions and corresponding high efficiencies. These technological advances are producing wood burning units that are very promising for natural-resource rich states like Maine.

### **Conclusion**

The most important message is to get out in front of the power curve on the issue of wood burning and new technologies.<sup>1</sup> The key conclusion is that while addressing air quality from woodstoves, lower emissions generally go hand in hand with higher thermal efficiencies. In other words, the cleaner the unit burns, the more heat output the unit produces. So even as new technology improves air emissions, the same technology requires less wood to be burned for the same heat output.

Unfortunately, as a winter with record high oil prices approaches, wood stoves with older non-EPA certified technology, perhaps units that have not been used for years, are likely to be reinstalled to combat high energy prices. A potential air quality consequence associated with wood combustion is that the widespread use of older wood burners will lead to higher emissions and will likely create local air quality problems in Maine where concentrations of these older stoves are present.

A high priority that needs to be addressed is how to accelerate the transfer of newer wood-burning technology to replace older, outdated technology across Maine as a way to provide cleaner emissions as well as to maximize the heat output of renewable wood fuel.

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<sup>1</sup> When new technologies replace older technologies and provide improvements in air emissions as well as thermal efficiencies, the same concept applies regardless of the fuel source. In short, whether wood or fuel oil is being burned, updated technology will result in cleaner emissions with less fuel consumption.